|  |
| --- |
| **Module 1 Activity**  **Lab activity 1 : Sorting Machine** |
| **Objective:** Analyze a control task, develop and implement a practical solution for a control task. |
| A conveyor belt starts and stops using green and red pushbuttons respectively, green light goes ON to indicate that conveyor belt is moving. If any object is detected by an inductive sensor white light goes ON until the object is sorted out by a branching arm and detected by a fiber optic barrier. The conveyor belt stops if any of the following occurs:   * + The stop red pushbutton is pressed.   + The number of the metallic objects detected is 4   + The optical sensor at the end of the conveyor belt detects 5 non-metallic objects.   **Use The Edutrainer prototype production line to implement this control task.**   1. Create an I/O assignment list.  |  |  | | --- | --- | | **Inputs** | | | Input | Address | | Green pushbutton (N.O) | I1 | | Red pushbutton (N.C) | I2 | | Inductive sensor (N.O) | I12 | | Fiber optic barrier | I11 | | Optical sensor | I10 | | **Outputs** | | | Output | Address | | Green Indicator Light | Q1 | | White Indicator light | Q2 | | Branching arm | Q7 | | Conveyor belt motor | Q8 |  1. Analyze the system requirements and write the Boolean expression for each output.   For RS latch block use the expression form given in figure 1.12   |  | | --- | | untitled.bmp  Note: | | **Figure 1.12 RS latch Boolean expression** |  |  |  |  | | --- | --- | --- | | **System requirements** | | | | Output | Requirements | Boolean expression | | Green indicator | Conveyor belt is ON |  | | White indicator | Branching arm is ON |  | | Branching arm | It goes ON when I12 detects metal and it keeps ON until I11 detects a sliding object (metallic object is sorted out) |  | | Conveyor belt | It goes on when I1 is pressed and keeps ON till  I2 is pressed  Counter 1 counts 4  Counter 2 counts 5 | C1, C2 refer to counters 1 and 2 |  1. Draw the FBD for this control task.   Note : pressing the green pushbutton should reset all counters   |  | | --- | | untitled.bmp |  1. Use the LOGO! Soft comfort software to solve this task.   While solving this control task you are required to produce a connection table and to describe the task in the properties window.   1. Simulate the program and fill in the table provided below by writing either **ON** or **OFF**:  |  |  |  |  |  | | --- | --- | --- | --- | --- | | Conditions:  Green PB is pressed and then released  White PB is not pressed  All sensors are inactive | | | | | | Output | Conveyor belt | Branching arm | Green indicator | White indicator | | Status | ON | OFF | ON | OFF | | Conditions:  Green PB is pressed and then released  White PB is not pressed  Only inductive sensor is active | | | | | | Output | Conveyor belt | Branching arm | Green indicator | White indicator | | Status | ON | ON | ON | ON | | Conditions:  Green PB is pressed and then released  White PB is not pressed  All sensors are inactive , 4 metallic objects are sorted out | | | | | | Output | Conveyor belt | Branching arm | Green indicator | White indicator | | Status | OFF | OFF | OFF | OFF |  1. Run and test the program. |
| **Lab activity 2 : N.O and N.C sinking and sourcing sensors** | |
| **Objective:** Use normally open and normally close sinking and sourcing sensors   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Some sensors are 4 wire sensors, in general wires are as follows:   |  |  | | --- | --- | | Blue | 0 VDC | | Brown | +V | | White | N.C | | Black | N.O | | photo1.JPG | | | **Figure 1.14 4 wire sensor** | | | 1. Connect the fiber optic barrier sensor as shown in figure 1.15. 2. Create and test the programs given   In the table provided below and write your comments.   |  |  | | --- | --- | | Program | Comments | | untitled.JPG | When activating the sensor light goes ON | | untitled.JPG | When activating the sensor light goes OFF | | | photo.JPG | | | **Figure 1.15** | | | 1. Connect the fiber optic barrier sensor as shown in figure 1.16. 2. Create and test the programs given   In the table provided below and write your comments.   |  |  | | --- | --- | | Program | Comments | | untitled.JPG | When activating the sensor light goes OFF | | untitled.JPG | When activating the sensor light goes ON | | | photo.JPG | | | **Figure 1.16** | | | |

|  |
| --- |
| **Lab activity 3: Latches using ladder diagram** |
| **Objective:** understand and apply latches.  Try the following control routines, and write down your comments:   |  |  |  | | --- | --- | --- | | **Ladder diagram** | **Actions** | **Comments** | | untitled.JPG | Press and release the green PB. | Green light stays ON as long as the green PB is pressed. | | untitled.JPG | Press and release the green PB. | Green light goes ON once the green PB is pressed but it can’t be switched OFF. | | untitled.JPG | Press and release the green PB.  Then press the red one. | Green light goes ON once the green PB is pressed but it can’t be switched OFF. (I2 is useless) | | untitled.JPG | Press and release the green PB.  Then press the red one. | Green light goes ON once the green PB is pressed and it goes OFF once the red PB is pressed | | untitled.JPG | Press and release the green PB.  Then press the red one. | Green light goes ON once the green PB is pressed and it goes OFF once the red PB is pressed | |

|  |
| --- |
| **Lab activity 4: Interlocks** |
| **Objective:** understand and apply Interlocks.  Use the Edutrainer kit and LOGO! soft comfort software to create and implement the following control task:  Green PB and white PB are used to move the Edutrainer table in the forward and backward directions respectively while the red one is used to stop it, table keeps moving after releasing green or white PB till it reaches any of the proximity switches, once the table is detected by a proximity switch it stops automatically.  Software- based interlock must be used to ensure that forward and backward cannot occur at the same time.   1. Draw the ladder diagram for the previous control task.  |  | | --- | | untitled.JPG |  1. Run and test your program. |

|  |
| --- |
| **Lab activity 5: Message texts** |
| **Objective:** use message texts block.  Repeat the previous task and use the “Message texts“ programming block to show “Moving Forward” when table is moving in the forward direction and “Moving backward” when table is moving in the backward direction and “Stop mode” when table is not moving.   1. Draw the ladder diagram for the previous control task.  |  | | --- | | untitled.JPG |  1. Run and test your program. |